

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS IN DRY-CELL BATTERIES

(71) We, TUWA PLASTIK DR. HERBERT WARNECKE an Austrian firm of Dampfmühlgasse 5, 1111 Vienna, Austria, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a dry-cell battery and particularly to such batteries with a cylindrical or prismatic battery body and a plastics casing which surrounds the latter at least in part. In this specification the term dry-cell battery means a battery consisting of one or more dry cells.

Cylindrical dry-cell batteries are at present provided with casings of cardboard, sheet steel or plastics material. Because of their sensitivity to liquids, the cardboard casings have been largely superseded by steel jackets. In this case, either a thin-walled plastics foil is shrunk around the zinc beaker of the cell, or the latter is covered with a cardboard jacket in order to insulate the steel jacket from the cell. The steel jackets have the disadvantage of having longitudinal seams. Moreover, at least three parts are necessary, i.e. the substrate (plastics foil or cardboard jacket), a covering plate, and the steel jacket itself, all of which have to be fitted separately. Furthermore, they are not sufficiently resistant to shock, because, for example, the bending of the steel jacket around the lower end of the battery body results in internal tensions, and the seams are not sufficiently stable. Furthermore, they do not allow the gases generated in the battery to escape and this may result in a bursting of the batteries.

Casings made of synthetic material partially obviate these disadvantages. They consist of one piece and are therefore more easily fitted. They are free from tension since they are moulded hot. The synthetic

material is non-conductive and therefore also resistant to leakage current. Moreover, the plastics casings enable the gases generated in the battery under extreme load to be diffused, but they retain the electrolyte liquid. On the other hand, the plastics casings have their disadvantages. Their mechanical stability is too low so that, in the case of intermittent loading, the gas pressure generated in the cell may cause the casing to burst, since pressure up to 9 atmospheres may be experienced. Moreover the plastics casing also gives way in lateral direction. Furthermore, the plastics casing can only be printed by screen or offset printing; however, the fastness to abrasion of these prints is low and identifications or other inscriptions may easily become illegible. In addition, they have the property of being electrostatically charged on the surface and thus to attract dust whereby the necessary inscriptions likewise become difficult to read. There is also the risk that in the case of intense solar radiation, for example, in shop windows, and also under illumination with fluorescent tubes, the plastics material may be decomposed and the required mechanical stability may be lost altogether.

According to the invention there is provided a dry-cell battery with a battery body and a plastics casing which surrounds the body at least in part, at least part of the circumferential surface of the plastics casing being covered by a metal foil which is bonded to the plastics casing. The foil may be coated on one side or on both sides, for example, with one or several layers of a hot-sealing varnish and/or a plastics material and/or an adhesive.

Due to the conductivity of the metal foil, the disadvantageous static charge of the plastics casing is eliminated while, on the other hand, there is no risk of a leakage current or galvanic effects provided the

distance of the foil from the zinc surface of the cells is sufficient. Due to the plastics material, the casing according to the invention can still diffuse the gases generated. The gas then escapes through the parts of the casing which are not covered with metal foil; this will most advantageously be the head part of the casing. The metal foil coating imparts to the plastics casing an improvement of the mechanical stability; this is an essential advantage of the casing according to the invention. Moreover, the metal foil offers a greater variety of printing possibilities, the main advantage being that any identification or other inscription applied to the metal foil lasts better on the latter and cannot be so easily damaged or rendered illegible by external influences.

20 An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a vertical cross-section of a dry-cell battery according to the invention; and

Figure 2 shows an enlarged fragmentary cross-section of an alternative casing construction.

Referring to Figure 1 this shows a dry-cell battery having a body 2 which, in this example, is cylindrical and has planar top and bottom surfaces. One electrode 4 of the battery projects upwards from the top surface of the battery body. The zinc can of the battery body 2 is surrounded by a plastics casing 1 made of a thermoplastic material, for example, a polyolefin such as polystyrene or polyethylene. The plastics casing 1 may correspond to the known plastics casing of dry-cell batteries. The plastics casing 1 is made of one piece and completely surrounds the cylindrical surface of the zinc can of the dry-cell battery body 2. It extends around the outer edge of the bottom surface of the dry-cell battery body 2 but does not cover the bottom surface and covers the top surface of the battery but leaves the electrode exposed.

50 The greater part of the cylindrical surface of the casing 1 is covered with a metal foil 3 which is bonded to the plastics casing. The foil is, for example, of aluminium or laminated aluminium. This foil surrounds the dry-cell body like a cylinder. The identification or other inscription is printed on this metal foil 3. If desired, the metal foil, together with exposed parts of the plastics casing can be covered with a varnish layer; in general, the inscription and the surface of the foil will then be even better protected.

It is particularly advantageous to coat the metal foil 3, after printing, with a layer of hot-sealing varnish on one or both sides

of the foil and then to apply the resultant foil laminate to the plastics casing 1.

Figure 2 shows another form of casing having a foil laminate which also has a metal foil 5 and an overlying varnish layer 6. The foil laminate may be secured to the plastics casing 1, for example, by coating with an adhesive 9. It is advantageous to provide the foil laminate with an adhesive layer 9 so that a foil-metal/adhesive laminate or varnish/foil-metal/adhesive laminate is formed.

Since the foil laminate is to be produced first and then applied to the plastics casing 1 as a unit, the bonding between the foil laminate and the plastics casing should be achieved as rapidly and satisfactorily as possible. For this purpose, it is particularly advantageous to include in the foil laminate a bottom layer 8 made of the same plastics material as the plastics casing 1. In principle, it would then be possible to achieve the bonding of the foil laminate and the plastics casing by welding. However, it is easier to apply an adhesive layer 9 to this plastics layer 8. The adhesive used for this purpose then only needs to have an especially good bonding property in relation to the actual material of the casing 1.

In order to improve the adhesion of the plastics foil or plastic layer 8 to the metal foil 5 it is frequently also expedient to insert a plastics layer 7 of a different plastics material between these two layers so that different methods of bonding or adhesives can be used which are best suited to the materials being joined in each case. In this way there is obtained a foil laminate as shown in Figure 2 applied to the plastic casing 1.

The simplest method (Figure 1) consists of glueing the metal foil 3 on to the plastics casing 1 by means of a suitable adhesive. It is possible, for example, to coat the metal foil with an adhesive of a high melting point and then to glue it on to the casing with the use of a hot roller for the application of heat. Heat and pressure are thus simultaneously applied to the metal foil 3 placed on the plastics casing 1. Obviously, it is also possible to apply this process when a foil laminate with different layers, such as described above with reference to Figure 2, is used. However, it has been found by experiment that the most expedient method of applying the foil, especially if a foil laminate is used, for example, the one described in Figure 2, to the plastics casing consists in heating first the whole foil or foil laminate itself and then to press this heated foil or foil laminate on to the plastics casing. In many cases, especially when a welded bond is desired between the plastics casing and

the plastics bottom layer 8 of the foil laminate, it may moreover be advantageous to heat also the plastics casing 1 itself before bringing about the bond under pressure. In the case of a welded bond, the adhesive layer is omitted.

The advantages of the dry-cell battery according to the invention described above are apparent from the examples as described and illustrated, and it will be seen, in particular, that the mechanical stability of the known plastics casings is likewise improved in this way and that the bursting pressure, in particular, is increased. The essential feature is that in this way the advantages of the metal casings can be combined with those of the plastics casings.

WHAT WE CLAIM IS:—

1. A dry-cell battery with a battery body and a plastics casing which surrounds the body at least in part, at least part of the circumferential surface of the plastics casing being covered by a metal foil or metal foil laminate which is bonded to the plastics casing.

2. A dry-cell battery according to claim 1 in which the battery body is cylindrical or prismatic.

3. A dry-cell battery according to claim 1 or 2 in which the foil is of aluminium.

4. A dry-cell battery according to claim 1, 2 or 3 in which the foil is coated on at least one side with hot-sealing varnish.

5. A dry-cell battery according to claim 4 in which the metal foil is coated on the

side adjacent to the plastics casing with a hot-sealing varnish.

6. A dry-cell battery according to claim 1, 2, 3, 4 or 5 in which the foil is laminated with a layer of a plastics material to form a foil laminate which is bonded to the plastics casing, the layer of plastics material being adjacent the casing.

7. A dry-cell battery according to claim 6 in which the plastics material of the laminate is the same as the material of the plastics casing.

8. A dry-cell battery according to claim 6 or 7 in which the foil laminate is bonded to the plastics casing by plastics welding.

9. A dry-cell battery according to any of the preceding claims in which the foil or foil laminate is coated on its inside with an adhesive.

10. A process for the production of a dry-cell battery according to any of the preceding claims characterised in that the metal foil is heated and then pressed on to the plastics casing under pressure.

11. A dry-cell battery substantially as described hereinbefore with reference to the accompanying drawings.

12. A process for making a dry-cell battery substantially as hereinbefore described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

Fig. 1

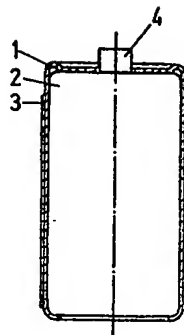
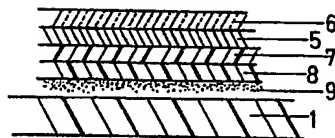


Fig. 2



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